GREATER TORONTO AREA
URBAN STRUCTURE CONCEPTS STUDY

BACKGROUND REPORT NO. 5
GREENING/ENVIRONMENT

Prepared for
The Greater Toronto Coordinating Committee

IBI GROUP
in association with
BRUCE BROWN ASSOCIATES LIMITED

JUNE, 1990

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June 8, 1990

Mr. E. M. Fleming
Chairman
Greater Toronto Coordinating Committee
5 Park Home Avenue
Suite 210
North York, Ontario
M2N 6L4

Dear Mr. Fleming:

Background Paper No. 5: Greening/Environment

This is the fifth in a series of background reports for the Greater Toronto Area Urban Structure Concepts Study. The background reports in the series are as follows:

1. Description of Urban Structure Concepts;
2. Minimal Growth Option;
3. Transportation Systems;
4. Water, Sewers and Solid Waste;
5. Greening/Environment;
6. Human Services;
7. Comparison of Urban Structure Concepts;
8. Public Attitudes Survey (to follow in Fall, 1990).

The overall study results are presented in a separate report titled Summary Report: Greater Toronto Area Urban Structure Concepts Study.

This background report addresses the implications of the three urban structure concepts in terms of their impact on land resources and water quality. Other important issues relating to sustainable development (e.g. transportation emissions and energy consumption) are developed in Background Report No. 3, Transportation Systems, and are included in the overall comparison of the concepts as described in Background Report No. 7 and the Summary Report.

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This study breaks new ground by drawing together demand, supply, cost and effectiveness findings for three quite different future urban forms for the entire GTA including both "hard" and "soft" infrastructure. There is, therefore, little precedent against which to assess the results, some of which are perhaps unexpected or at least thought-provoking. The results are therefore preliminary, for discussion. If, as the findings are scrutinized and the comparison ratings are discussed, a consensus emerges regarding a preferred future urban structure for the GTA and/or process for moving purposefully in that direction, the study will have served its purpose.

The opinions offered herein are those of the consultant and reflect to the extent possible comments received from the Urban Structure Subcommittee established for this study. They do not necessarily reflect the views of the Greater Toronto Coordinating Committee or the governments represented on the Committee.

We trust that the information and opinions offered will be helpful in the context of the study and subsequent planning activities and decisions.

Yours sincerely,

IBI GROUP

Neal A. Irwin
Managing Director

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Greater Toronto Area Urban Structure Concepts Study: Background Report No. 5: Greening/Environment: Executive Summary

This background report compares the three urban structure concepts in terms of their impact on land resources and water quality.

URBANIZED AREA

The GTA has a land area of approximately 2,780 sq. miles (7210 km²). About 590 sq. miles (1,500 km²) of this area is now urbanized (21%). The additional amount of land that would be urbanized by 2021 in each concept is as follows:

Concept 1, Spread	-	350 sq. miles (900 km²)
Concept 2, Central	-	130 sq. miles (340 km²)
Concept 3, Nodal	-	230 sq. miles (590 km²)

GREENLANDS FRAMEWORK

The three concepts would involve different amounts of urban encroachment on the Oak Ridges Moraine area and along the Lake Ontario waterfront. The estimated amounts of encroachment are as follows:

	Oak Ridges Moraine Area (sq. miles)	**Lake Ontario Waterfront (miles)**
Concept 1, Spread	35 (90 km²)	10 (16 km)
Concept 2, Central	10 (26 km²)	4 (6 km)
Concept 3, Nodal	20 (52 km²)	6 (10 km)

AGRICULTURAL CAPABILITY

The following table indicates the additional Class 1, 2 and 3 agricultural land areas that would be within the 2021 urban envelope for each concept as compared to the present urban envelope:

Class	Concept 1, Spread (sq. miles)	Concept 2, Central (sq. miles)	Concept 3, Nodal (sq. miles)
1	189	39	98
2	13	6	9
3	11	0	5
TOTAL	213 (545 km²)	45 (115 km²)	112 (287 km²)

FOREST RESOURCES

The existing rural forest covered areas that would fall within the urban envelope by 2021 are estimated as follows:

- Concept 1, Spread — 27 sq. miles (70 km²)
- Concept 2, Central — 15 sq. miles (39 km²)
- Concept 3, Nodal — 20 sq. miles (52 km²)

MINERAL RESOURCES

The extent to which sand and gravel resource areas and bed rock resource areas would be located within the GTA urban envelope is shown below

Type of Resource Area	Concept 1, Spread	Concept 2, Central	Concept 3, Nodal
Sand and Gravel			
Primary Significance	1 sq. mile	1 sq. miles	1 sq. mile
Secondary Significance	9 sq. miles	2 sq. miles	6 sq. miles
Bedrock			
Limestone/Dolostone	---	---	---
Sandstone	---	---	---
Shale	3 sq. miles	---	1 sq. mile
TOTAL	13 sq. miles (33 km²)	3 sq. miles (8 km²)	8 sq. miles (20 km²)

PASSIVE OPEN SPACE

Approximately 26 sq. miles (or 67 km²) of passive open space were within the 1986 GTA urban envelope. This passive open space includes natural areas such as river valleys, conservation areas, waterfront parks and other areas that are available for outdoor leisure and enjoyment.

The following table indicates the amount of passive publicly owned open space that would be within the urban envelope by the year 2021 for each concept.

	Present Urban Envelope	Concept 1, Spread	Concept 2, Central	Concept 3, Nodal
Passive Open Space (acres)	16,000	24,200	18,400	18,900
Urban Population	3.7 million	6 million	6 million	6 million
Space/1000 people (acres)	4.4	4.0	3.1	3.2

Two approaches were taken to reflect the above differences in terms of capital costs to acquire enough passive open space to maintain the existing rate of 4.4 acres/1,000 people. The first was to estimate the cost of the additional land if acquired **within the urbanized area of each concept:** $1.1 billion for Concept 1, $6.0 billion for Concept 2 and $4.7 billion for Concept 3. This provides an economic comparison, but acquiring an additional 8,000 acres in the urbanized area of Concept 2, for example, would obviously be impractical. The second approach, therefore, was to assume that all three concepts would be provided with the same amount of passive open space **within the urbanized area of Concept 1**, at a cost of $1.1 billion for each concept. Under this assumption, residents in Concept 2 or Concept 3 would have to travel further, on average, than those in Concept 1 to experience the newly acquired open space which would largely be in the suburbs. The relative rating is the same regardless of which approach is used: Concept 1 is rated **High**, Concept 2 **Low** and Concept 3 **Medium-Low**. A range of capital cost estimates under this component is carried forward to the capital cost summary presented in Background Report No. 7 and the Summary Report, reflecting the two alternative approaches to this comparison.

CONTAMINATED SOIL

It is estimated that urban redevelopment in the three concepts would involve the following land areas:

Concept 1, Spread	-	2,750 acres
Concept 2, Central	-	11,000 acres
Concept 3, Nodal	-	4,750 acres

Based on these estimates, it is concluded that Concept 2 would present a more difficult situation for the disposal of contaminated soil than other concepts. At the same time, however, it is possible that the economic viability of such disposal in Concept 2 would be higher than in the other concepts because of the higher densities involved in this concept.

WATER QUALITY

Based on other studies, it is estimated that the improvement of water quality throughout the GTA could involve capital expenditures in the order of $2 billion. It is not possible to determine the extent to which capital expenditures would vary among the three urban structure concepts. The potential for improving water quality, however, does vary because of the different amounts of redevelopment. Concept 2, Central, involves significant redevelopment of existing urban land which provides potential for retrofitting such areas to improve storm water drainage quality. There is also some potential in Concept 3, Nodal for such retrofitting for stormwater drainage. Concept 1, Spread offers less potential for retrofitting existing urbanized areas.

AIR QUALITY AND ENERGY CONSUMPTION

Background Report No. 3: Transportation Systems describes the estimates of transportation emissions and energy consumption for the three concepts. They are both highest for Concept 1, lowest for Concept 2 and intermediate for Concept 3.

OVERALL GREENING/ ENVIRONMENT COMPARISON OF CONCEPTS

The comparison of the concepts is summarized as follows:

Measure	Concept 1, Spread	Concept 2, Central	Concept 3, Nodal
Low encroachment on agricultural land	Low	Medium-High	Medium
Low impact on forest resources	Low	Medium-High	Medium
Low impact on mineral resources	Low	Medium-High	Medium-Low
High compatibility with greenlands concept	Low	High	Medium
High available amount of passive open space	High	Low	Medium-Low
High ease of disposal of contaminated soils	Medium-High	Low	Medium
High potential for cleanup of contaminated soils	Medium-Low	Medium-High	Medium
High potential for improving quality of stormwater drainage	Medium-Low	Medium-High	Medium

Reduced atmospheric quality degradation from transportation emissions	Low	High	Medium
Low level of transportation energy consumption	Low	High	Medium

Greater Toronto Area Urban Structure Concepts Study: Background Report No. 5: Greening/Environment

1. INTRODUCTION

1.1 PURPOSE AND SCOPE

The purpose of this background report is to describe the analysis of greening/environmental factors which was carried out as part of Task 3.3 - Greening/Environment in the GTA Urban Structure Concepts Study. This study was carried out during the period February - June 1990, on behalf of the Greater Toronto Coordinating Committee.

The general objective of the Urban Structure Concepts Study is to develop three generic urban structure concepts for the GTA and to provide a broad, strategic comparison of the three concepts with particular emphasis on their infrastructure requirements (e.g. transportation, hard services, human services, open space) and the capital cost of such facilities, as well as impacts on the immediate hinterland of the GTA. It is important to emphasise that it is not a planning study, in that none of the three concepts are being put forward as a recommended plan. Rather, each of the concepts is a case study, postulated in order to examine the infrastructure and related functional and quality aspects of three quite different urban structure possibilities for the GTA.

The terms of reference for the Urban Structure Concepts Study include a statement that:

> "2.3.7 The description of urban structure options is to consider the achievement of a sustainable environment which would promote a healthful living style ..."

Accordingly, Task 3.3 - Greening/Environment addresses the implications of the three concepts in terms of their impact on land resources and water quality. This analysis interacts closely with the evaluations carried out in other tasks including Task 3.2 - Hard Services (which deals with water, sewer, and solid waste requirements), and Task 3.1 - Transportation (which includes estimates of the differences in automotive emissions amongst the concepts).

The analysis of greening/environmental factors was carried out by IBI Group in association with Bruce Brown Associates Limited. Other

members of the study team were consulted during the course of the work because of the interaction with other aspects of the study. Liaison was maintained with The Royal Commission on the Future of the Toronto Waterfront (Crombie Commission) and with the GTA Greenlands Strategy team (Kanter Study). The Royal Commission released a discussion paper on"A Green Strategy for the Greater Toronto Waterfront", and public hearings relative to the subject matter were held during April 1990. Ron Kanter, MPP, is developing options for a GTA Greenlands Strategy and is to report in June, 1990.

1.2 OVERVIEW OF URBAN STRUCTURE CONCEPTS

In accordance with the terms of reference, the three urban structure concepts were developed following the prescribed guidelines:

1. A status quo concept, representing a continuation of existing trends, characterized by substantial population growth in the suburban regions at relatively low density, with continuing concentration of office development downtown and in various sub-centres in Metro and the four adjacent regions (designated as **Concept 1, Spread**);

2. A concept in which substantial additional population growth/intensification occurs within Metro Toronto, and other "mature" urbanized areas adjacent to Metro along with further intensification of employment activities such that the rate of urbanization occurring beyond Metro boundaries would be significantly reduced (referred to as **"Concept 2, Central**); and

3. An intermediate concept in which residential and employment growth occurs primarily in and around various existing communities in a compact form, resulting in reduced consumption of undeveloped land relative to Concept 1 (referred to as **Concept 3, Nodal**).

Exhibit 1 shows the actual distribution of population and employment by region in the base year (1986) and the postulated distribution for each of the future years (2011 and 2021) for Concepts 1, 2 and 3. Also shown in each instance are the ratio of total employment to residential population in each region, referred to in this presentation as the activity rate, and estimates of the urbanized area and gross urban density for each concept.

The source of the base year numbers is the 1986 census and the reports prepared by Clayton Research Associates Limited and Hemson Consulting Ltd. for the Greater Toronto Coordinating Committee (GTCC) in October 1989. The source for the Concept 1

EXHIBIT 1

File Overview.wk1 07-Jun-90 08:47 AM

GTA Urban Structure Concepts: Overview of Population and Employment Distributions by Region

	DURHAM		HALTON		METRO		PEEL		YORK		GTA TOTAL	
BASE YEAR (1986)												
Resident Population, P (000's)	326		271		2193		592		351		3733	
Total Employment, E (000's)	137		119		1349		304		170		2079	
Activity Rate (E/P)	0.420		0.439		0.615		0.514		0.484		0.557	
Urbanized Area (000's of acres)	49.2		45.4		152.9		74.1		54.8		376.4	
Gross Density ([P+E]/Urbanized Area)	9.4		8.6		23.2		12.1		9.5		15.4	
	2011	2021	2011	2021	2011	2021	2011	2021	2011	2021	2011	2021
CONCEPT 1: Spread												
Resident Population, P (000's)	673	794	497	593	2358	2428	1060	1198	851	1007	5438	6020
Total Employment, E (000's)	280	309	244	271	1686	1724	593	631	456	505	3259	3440
Activity Rate (E/P)	0.416	0.389	0.491	0.457	0.715	0.710	0.559	0.527	0.536	0.501	0.599	0.571
Urbanized Area (000's of acres)	87.3	99.3	74.3	84.7	152.9	152.9	119.0	129.3	116.5	133.5	550.0	599.7
Gross Density ([P+E]/Urbanized Area)	10.9	11.1	10.0	10.2	26.4	27.2	13.9	14.1	11.2	11.3	15.8	15.8
CONCEPT 2: Central												
Resident Population, P (000's)	455	475	362	378	3310	3800	794	828	517	540	5438	6020
Total Employment, E (000's)	253	263	203	211	2046	2183	465	479	293	304	3259	3440
Activity Rate (E/P)	0.557	0.554	0.560	0.560	0.618	0.574	0.585	0.578	0.566	0.564	0.599	0.571
Urbanized Area (000's of acres)	68.4	70.8	59.6	61.7	152.9	152.9	95.5	98.3	77.4	80.1	453.8	463.8
Gross Density ([P+E]/Urbanized Area)	10.4	10.4	9.5	9.5	35.0	39.1	13.2	13.3	10.5	10.5	19.2	20.4
CONCEPT 3: Nodal												
Resident Population, P (000's)	595	681	464	545	2626	2800	1050	1190	703	804	5438	6020
Total Employment, E (000's)	288	312	240	266	1748	1794	600	651	383	417	3259	3440
Activity Rate (E/P)	0.484	0.458	0.517	0.488	0.666	0.641	0.571	0.547	0.545	0.519	0.599	0.571
Urbanized Area (000's of acres)	77.4	84.7	63.5	69.4	152.9	152.9	109.9	118.4	88.0	96.4	491.7	521.8
Gross Density ([P+E]/Urbanized Area)	11.4	11.7	11.1	11.7	28.6	30.0	15.0	15.5	12.3	12.7	17.7	18.1

Note: Concept 1 is the GTCC "Base Case" Projection.

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figures is the Clayton and Hemson reports taking the "base case" projections prepared for the GTCC.

As indicated in Exhibit 1, the resident population in the GTA was about 3.7 million people in 1986. Based on the GTCC projections, the resident population is expected to rise to about 6 million people by the year 2021, an increase of some 2.3 million people over the 35 year period between 1986 and 2021. Similarly, total employment in the GTA is projected to rise from about 2 million jobs in 1986 to 3.4 million jobs by the year 2021, an increase of some 1.4 million jobs over the 35 year period.

Concepts 1, 2 and 3 are illustrated in Exhibits 2, 3 and 4 respectively.

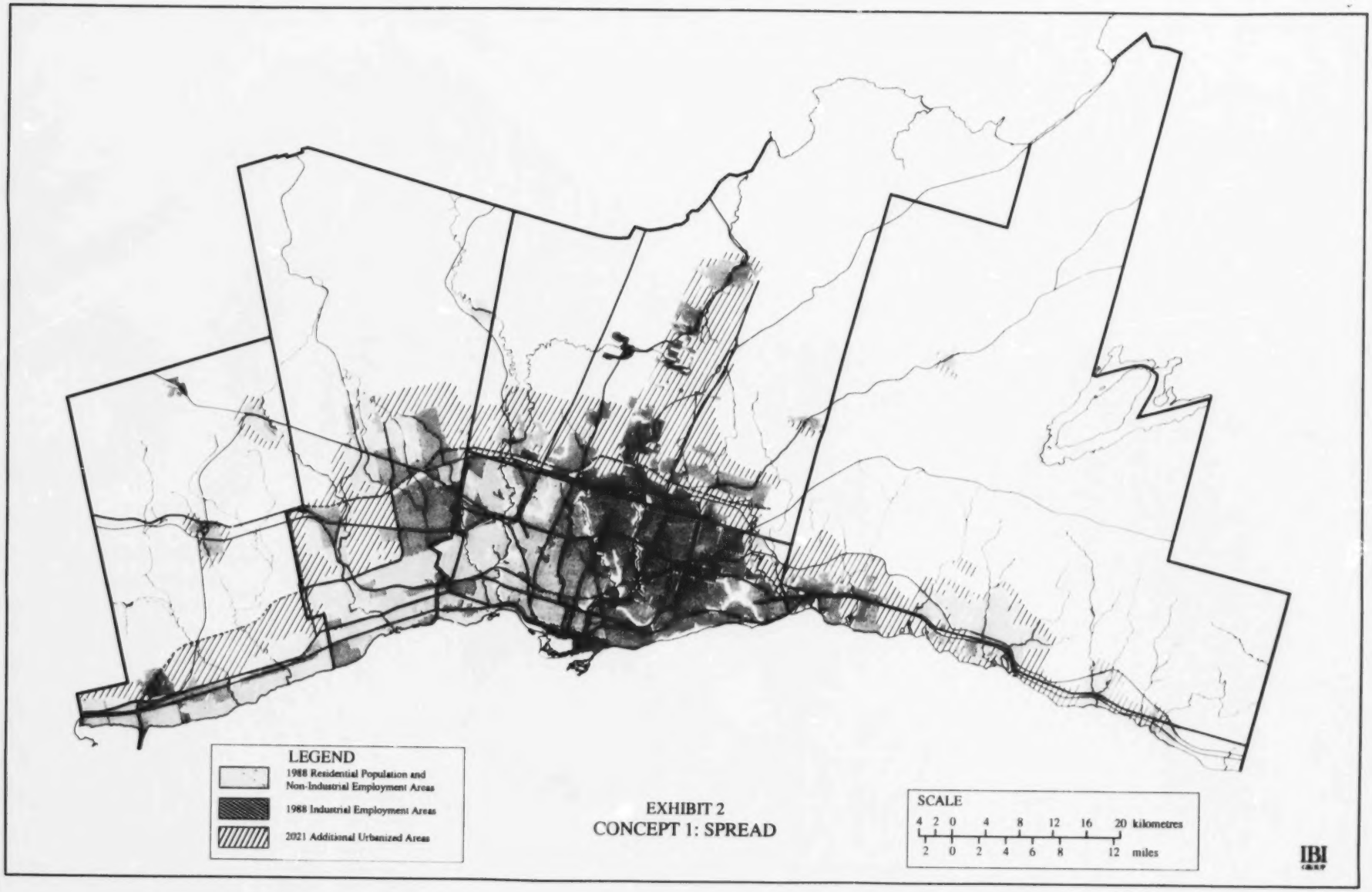
LEGEND
1988 Residential Population and Non-Industrial Employment Areas
1988 Industrial Employment Areas
2021 Additional Urbanized Areas
SCALE
4 2 0 4 8 12 16 20 kilometres
2 0 2 4 6 8 12 miles
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EXHIBIT 2
CONCEPT 1: SPREAD

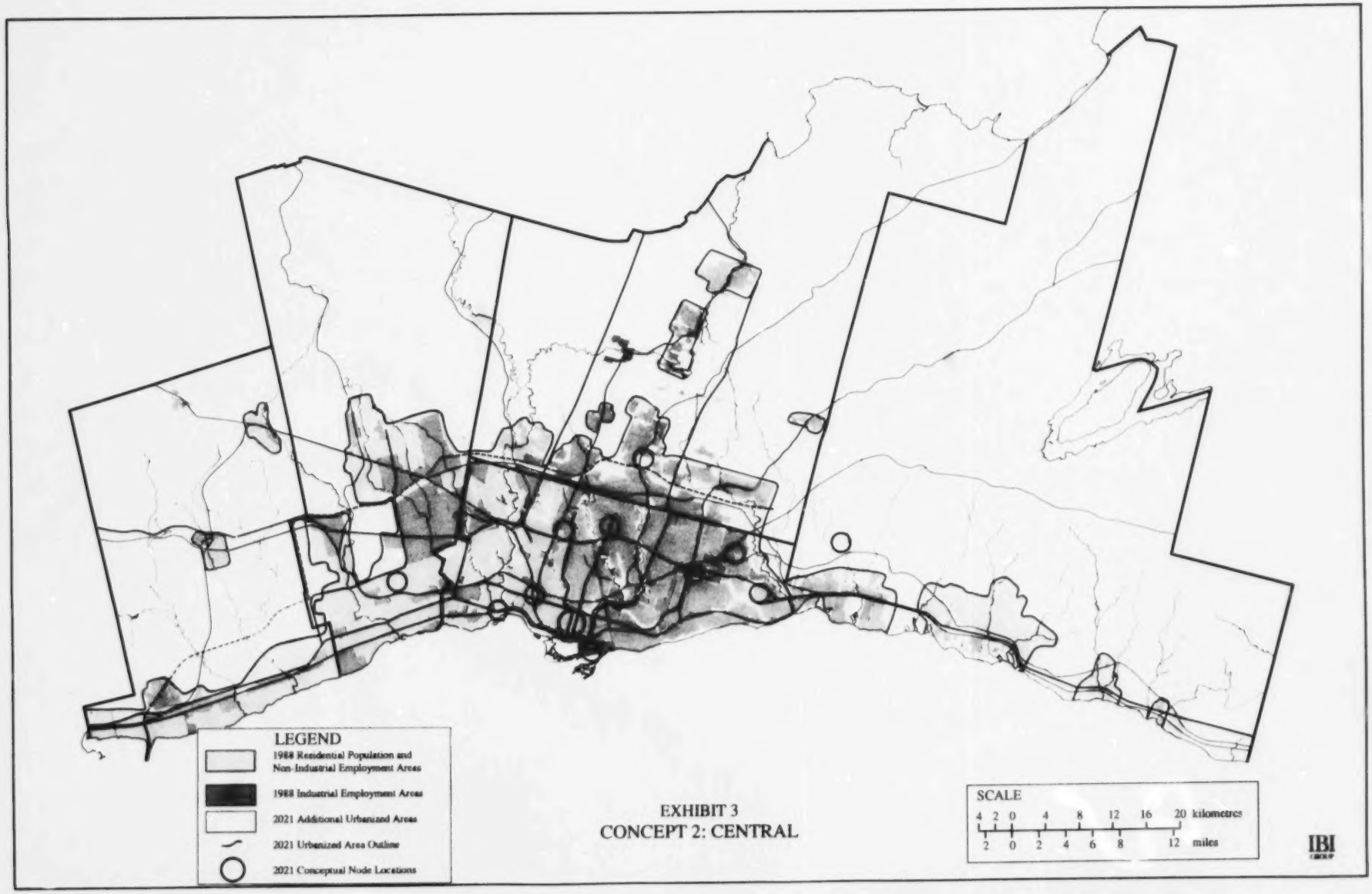
LEGEND
1988 Residential Population and Non-Industrial Employment Areas
1988 Industrial Employment Areas
2021 Additional Urbanized Areas
2021 Urbanized Area Outline
2021 Conceptual Node Locations
SCALE
4 2 0 4 8 12 16 20 kilometres
2 0 2 4 6 8 12 miles
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EXHIBIT 3
CONCEPT 2: CENTRAL

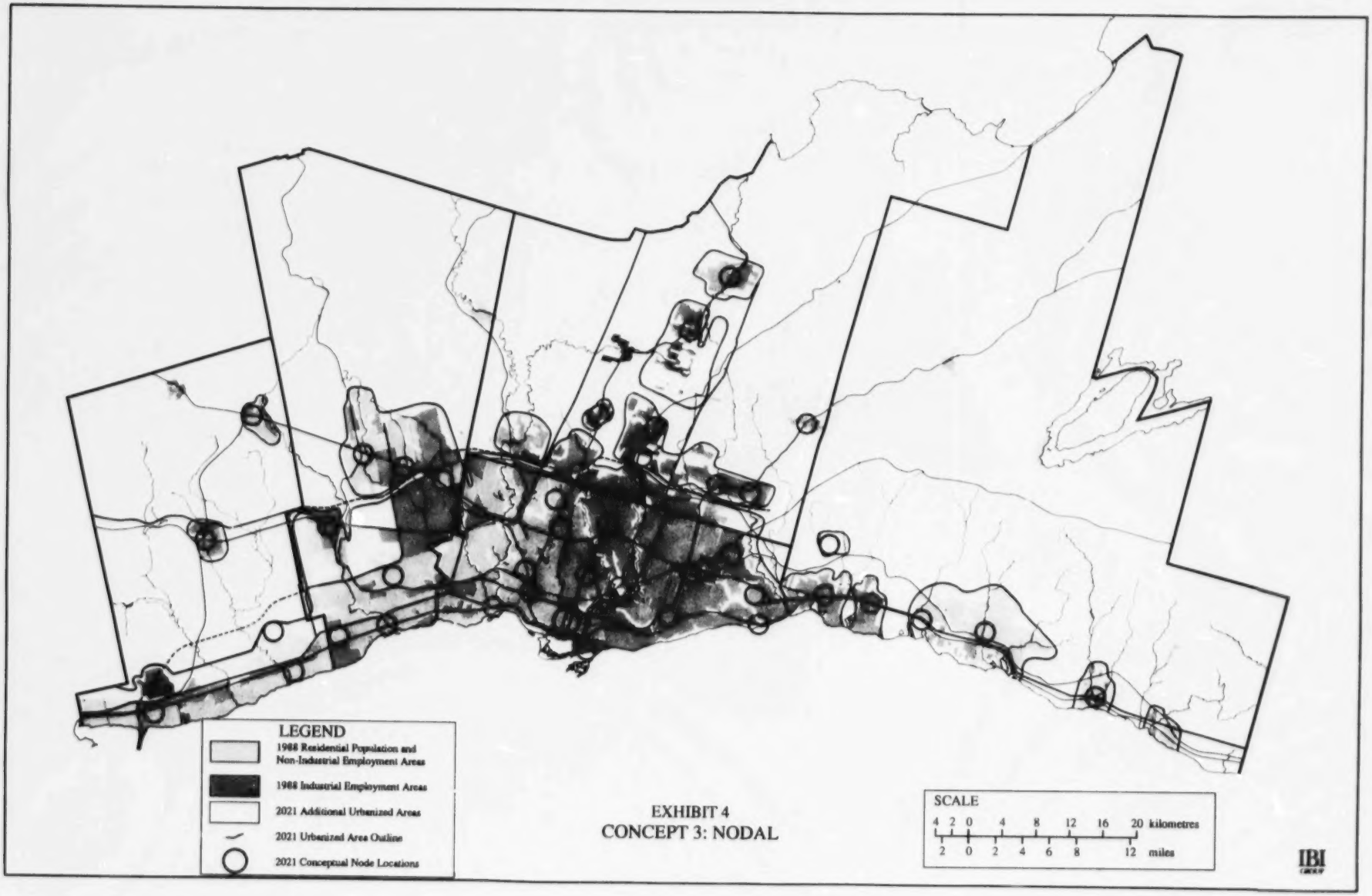
LEGEND
1988 Residential Population and Non-Industrial Employment Areas
1988 Industrial Employment Areas
2021 Additional Urbanized Areas
2021 Urbanized Area Outline
2021 Conceptual Node Locations
SCALE
4 2 0 4 8 12 16 20 kilometres
2 0 2 4 6 8 12 miles
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EXHIBIT 4
CONCEPT 3: NODAL

2. CURRENT PLANS AND PROGRAMS

The high level of public interest in greening/environmental matters in the GTA is reflected in many initiatives being taken by all levels of government. Some of these initiatives include:

- the Greater Toronto Area Greenlands Strategy, Ron Kanter, MPP (Kanter Study);
- the Royal Commission on the Future of the Toronto Waterfront (Crombie Commission);
- the Metro Toronto Remedial Action Plan (RAP) which is sponsored by Environment Ontario and Environment Canada;

This section discusses the context and data base provided by these and other initiatives.

2.1 GREATER TORONTO AREA GREENLANDS STRATEGY (KANTER STUDY)

In October, 1989, Ron Kanter, MPP was appointed to develop a Greater Toronto Greenlands Strategy. The term "greenlands" includes:

- greenspace corridors and related outdoor recreation (e.g. hiking, biking, walking, cross country skiing trails);
- significant natural, cultural and archaeological areas,
- natural processes/functions performed by greenlands (e.g. recharge/discharge), and
- rural lands.

The main tasks in the Kanter Study are:

(a) defining a greenlands system

(b) examining various mechanisms to secure greenlands, and

(c) examining alternative institutional arrangements.

The Kanter Study is being carried out in parallel with this study of urban structure concepts. Liaison has been maintained between the two studies, particularly with respect to the sharing of basic information that is common to both studies.

2.2 ROYAL COMMISSION ON THE FUTURE OF THE TORONTO WATERFRONT (CROMBIE COMMISSION)

The Interim Report of the Crombie Commission issued in August 1989 stated that:

> "More generally, the Commission recommends that, across the entire watershed, a "green" strategy be devised to preserve the waterfront, river valley systems, headwaters, wetlands, and other significant features in the public interest. Such a strategy would physically link the waterfront to the river valley systems which, in turn, would be linked by the preserved headwater areas. A continuous trail system would guarantee public access to these natural and open spaces."

It is noted that the Commission recommends the immediate implementation of the Metro Toronto RAP, and the safeguarding of all natural areas along the waterfront and in the river valleys. The Commission notes "...the need for a green belt, created from an integrated system of nodes and linkages, across the Toronto waterfront."

The Royal Commission issued a report on "A Green Strategy for the Greater Toronto Waterfront; Background and Issues" as background to public hearings conducted in April 1990. The report notes that:

> "...it is possible to logically define a natural region abutting the Greater Toronto Waterfront, based on natural and physiographic features. Bounded by the Niagara escarpment to the west, the Oak Ridges Moraine to the north, and Lake Ontario to the south, the lands within this wedge shaped bioregion share many ecological similarities. Its soils and land forms are based on the glacial deposits of the Lake Ontario plain, rising to the gravelly hills of the Oak Ridges Moraine; a series of watersheds rise in the Moraine, and follow parallel courses southwards to the Lake. Originally hard wood forest, then farm land, most of the bioregion now falls within the commuter and economic orbit of Toronto. As the term bioregion suggests, anything that happens within this area is tied ecologically to the health of the waterfront".

2.3 METRO TORONTO REMEDIAL ACTION PLAN (RAP)

The Metro Toronto Remedial Action Plan is being undertaken jointly by Environment Ontario and Environment Canada in consultation with the public. As stated in the recent draft Discussion Paper on Remedial Options, the Remedial Action Plan "... will take an ecosystem approach to restore water quality and protect the aquatic environment of the Metro Toronto waterfront and watersheds."

The Remedial Action Plan is expected to be completed by the winter, 1991.

The RAP draws on related work by other organizations such as the Toronto Area Watershed Management Strategy (TAWMS) which was initiated in 1981 to assess water quality problems and possible solutions for the Toronto Area watersheds.

The Discussion Paper on Remedial Options is structured in relation to seven "remedial intents" as follows:

1. Implement Specific Plans to Correct Local Use Impairments;
2. Reduce the Impacts of Treated and Untreated Sanitary Sewage;
3. Reduce the Impact of Dry Weather Sources;
4. Reduce the Impacts of Stormwater Runoff;
5. Increase Public Awareness and Public Involvement in Environmental Programs;
6. Foster Ecosystem Thinking Both Within and Outside the Metro Toronto RAP;
7. Conduct Research in Support of Short and Long Term RAP Implementation.

The geographic scope of the Metro Toronto RAP is very similar to that of the MTRCA Greenspace Strategy. A RAP is also being prepared for Hamilton Harbour.

2.4 OTHER INITIATIVES

Many other initiatives relating to greening/environment matters are being taken by government.

At the Federal level, a background report entitled "A Framework for Discussion on the Environment" was issued in the spring of 1990 and was the base for a series of information sessions in April and May and continuing consultation sessions in May and June of this year. It is understood that ideas and recommendations will be presented to the Federal Cabinet and a final report "The Green Plan: A National Challenge" will be released later in 1990.

Although the background paper deals with the entire spectrum of issues from global warming to ocean and arctic ecosystems, it does recognize needs for much improved environmental standards,

information, regulation, decision-making and economic incentives. There is also discussion of financial limitations relative to the scope of problems and remedial costs, as well as discussion of the principles of sustainable development.

Similarly, public concerns over the environment have initiated government activities at the local level. Intensive local efforts are being taken by the Environmental Protection Office (EPO) in the City of Toronto. Although most areas of environmental concern are governed by environmental protection, occupational health and safety legislation at the provincial level, the City EPO has undertaken original research in air and water quality matters and is a commenting agency in the plans approvals process. As such the City EPO has been successful at initiating site specific environmental agreements with development applicants and in using this tool to set relatively stringent environmental standards.

The six conservation authorities in the GTA have watershed plans and related studies. For example, in 1989, the Metropolitan Toronto and Region Conservation Authority (MTRCA) published a "Greenspace Strategy" for its watersheds. A total of $80 million over 10 years is required to implement the strategy in addition to MTRCA's current funding level.

3. CONCEPT COMPARISON: GREEN SPACE AND LAND CONSUMPTION

3.1 LAND CONSUMPTION

The GTA has a land area of approximately 2,780 sq. miles (7210 km²). About 590 sq. miles (1500 km²) of this area is now urbanized (21%). The additional amount of land that would be urbanized by 2021 in each concept is as follows:

Concept 1, Spread - 350 sq. miles (900 km²)
Concept 2, Central - 130 sq. miles (340 km²)
Concept 3, Nodal - 230 sq. miles (590 km²)

3.2 GREENLANDS FRAMEWORK

Exhibit 5 illustrates some of the major land resources in the GTA. The major resource areas indicated include:

- the Oak Ridges Moraine area;
- the Niagara Escarpment Plan Area;
- the river valleys;
- the Lake Ontario Waterfront;

In effect, the resources shown in Exhibit 5 provide a greenlands framework against which future urban development options can be examined. Other significant resources beyond the urban envelope can be added to this framework as appropriate e.g. critical wildlife habitat areas.

The main differences among the three concepts in relation to the greenlands framework are the relative amounts of urban encroachment on the Oak Ridges Moraine area and along the Lake Ontario Waterfront. The estimated amounts of encroachment are listed below:

	Oak Ridges Moraine Area (sq. miles)	**Lake Ontario Waterfront (miles)**
Concept 1, Spread	35 (90km²)	10 (16km)
Concept 2, Central	10 (26 km²)	4 (6km)

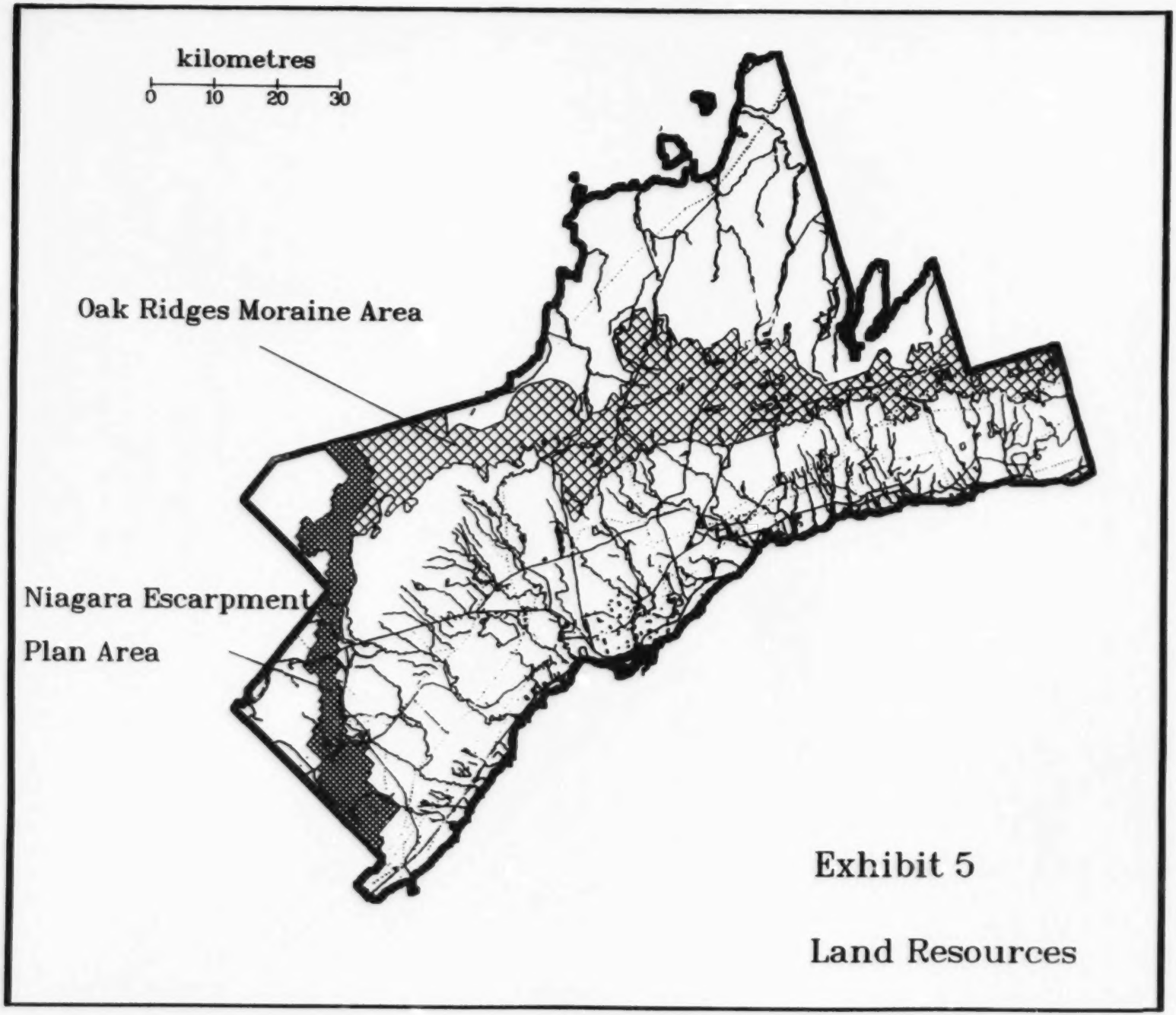

Exhibit 5

Land Resources

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Concept 3, Nodal	20 (52 km²)	6 (10km)

3.3 AGRICULTURAL CAPABILITY

Information provided by the Ministry of Agriculture and Food indicates that there are more than 5000 census farms in the GTA. The total farm capital value is in the order of $2.6 billion, which is more than 10% of the total farm capital value in Ontario.

The soil capability for agriculture definitions for classes 1, 2 and 3 in the Canada Land Inventory are:

- Class 1 - soils in this class have no significant limitations in use for crops;
- Class 2 - soils in this class have moderate limitations that restrict the range of crops or require moderate conservation practices;
- Class 3 - soils in this class have moderately severe limitations that restrict the range of crops or require special conservation practices.

The following table indicates the additional Class 1, 2, and 3 land areas that would be within the 2021 urban envelope for each concept as compared to the present urban envelope.

Class	Concept 1, Spread (sq. miles)	Concept 2, Central (sq. miles)	Concept 3, Nodal (sq. miles)
1	189	39	98
2	13	6	9
3	11	0	5
TOTAL	213 (545 km²)	45 (115 km²)	112 (287 km²)

3.4 FOREST RESOURCES

Research for the Kanter Study indicates that some 21% of the GTA is forest covered (about 580 sq. miles or 1500 km²). Most of the forested areas in the GTA are on privately owned land.

The existing rural forest covered areas that would fall within the urban envelope by 2021 are estimated as follows:

- Concept 1, Spread — 27 sq. miles (70 km²)
- Concept 2, Central — 15 sq. miles (39 km²)
- Concept 3, Nodal — 20 sq. miles (52 km²)

3.5 MINERAL RESOURCES

Research for the Kanter Study, shows that the pits and quarries in the GTA produce more than 43 million tonnes of sand, gravel and crushed stone annually. Approximately, 70 million tonnes of aggregate are consumed each year within the GTA.

The Ontario Geological Survey has mapped the location of mineral resources in the GTA. This information includes sand and gravel resource areas and bedrock resource areas. The sand and gravel resource areas are classified as primary significance and secondary significance. The bedrock resource areas are classified as limestone/dolostone, sandstone, and shale. The following table summarizes the extent to which these resource areas would be located within the GTA urban envelope in each of the three concepts.

Type of Resource Area	Concept 1, Spread	Concept 2, Central	Concept 3, Nodal
Sand and Gravel			
Primary Significance	1 sq. mile	1 sq. miles	1 sq. mile
Secondary Significance	9 sq. miles	2 sq. miles	6 sq. miles
Bedrock			
Limestone/Dolostone	---	---	---
Sandstone	---	---	---
Shale	3 sq. miles	---	1 sq. mile
TOTAL	13 sq. miles (33 km²)	3 sq. miles (8 km²)	8 sq. miles (20 km²)

It is noted that urbanization does not imply that these resources would be sterilized. Rather, there is a need to mitigate potential conflict between the use of these resources and other land uses through the planning and environmental assessment processes.

3.6 PASSIVE OPEN SPACE

At present, there are about 26 sq. miles (or 67 km²) of passive open space within the GTA urban envelope. This public open space includes natural areas such as river valleys, conservation areas, waterfront parks and other areas that are available for outdoor leisure and enjoyment. Privately-owned lands are not included nor are for active recreation including community playing fields and local parks. Active recreation space is discussed in Background Report 6: Human Services.

The following table shows the amount of passive open space that would be within the urban envelope by the year 2021 for each concept. This comparison is based on existing publicly-owned open space such as conservation areas. A comparison of the concepts is made on the basis of the amount of passive open space per 1000 people.

	Present Urban Envelope	Concept 1, Spread	Concept 2, Central	Concept 3, Nodal
Passive Open Space (acres)	16,000	24,200	18,400	18,900
Urban Population	3.7 million	6 million	6 million	6 million
Space/1000 people (acres)	4.4	4.0	3.1	3.2

As indicated above, there are about 4.4 acres of passive open space per 1000 people in the existing GTA urban envelope. By 2021, the rates would decrease to 3.1 in Concept 2, 3.2 in Concept 3, and 4.0 in Concept 1.

In order to match today's rate of 4.4 acres per 1,000 people, additional open space would have to be obtained as follows:

Concept 1, Spread - 2,200 acres
Concept 2, Central - 8,000 acres
Concept 3, Nodal - 7,500 acres

It would probably be feasible in Concept 1, to obtain the additional 2,200 acres through agreements with developers and through land acquisition. It is estimated that the land acquisition cost would be in the order of $1,100 million. This cost may be reduced to some extent by the dedication of open space through the land development process.

It would be much less feasible to obtain the additional amounts of passive open space indicated for Concepts 2 and 3 above i.e. 7,500 - 8,000 acres. In fact, creating these amounts of passive open space are in direct contradiction with the compact type of urban form associated with these two concepts. The costs of acquiring such amounts of land would be very high (in the order of $6 billion for Concept 2 and $4.7 billion for Concept 3) and it is unlikely that the indicated amounts of land could be assembled even if the funds were available.

It is clear that a different standard would have to apply to Concepts 2 and 3 probably involving a different quality of space than in Concept 1 as well as smaller amounts of space. The above capital cost estimates were used as one (theoretical) comparison measure. Another, more functional approach taken was to assume that 2,200 acres would be acquired under all these concepts, within the urbanized areas of Concept 1, at an estimated cost of $1.1 billion. Under this assumption all three concepts would have the same amount of passive open space available within the same total area, but residents in Concept 2 (and to a lesser extent, Concept 3) would have to travel farther, on average, to experience the new open space, most of which would likely be in the suburbs.

3.7 CONTAMINATED SOIL

During the past few years, there has been a growing awareness of the problems associated with the disposal of contaminated soil from urban redevelopment sites such as the downtown railway lands. These problems stem from a number of factors including the introduction of more stringent controls over lake filling and the extent of redevelopment of the older industrial areas such as the Ataratiri project in the City of Toronto.

Based on the population and employment allocations shown in Exhibit 1, it is estimated that the urban redevelopment areas in the three concepts would be as follows:

Concept 1 - 2,750 acres
Concept 2 - 11,000 acres
Concept 3 - 4,750 acres

Based on these estimates, it is concluded that Concept 2 would present a more difficult situation for the disposal of contaminated soil than other concepts. At the same time, however, it is possible that the economic viability of such disposal in Concept 2 would be higher than in the other concepts because of the higher densities involved in this concept.

The disposal of contaminated soil is a complex question as noted in Background Report No. 4 - Water, Sewers, and Solid Waste. The potential volume of such soils creates a large disposal problem. Much of the fill generated from industrial sites may not be hazardous waste and perhaps only about 10% of the materials are actually registerable, meaning they must be disposed of in licensed landfill. The majority of soils is surplus to the redevelopment program, but exceeds provincial commercial and industrial clean-up guidelines. At present such soil is destined to landfills in the absence of alternative

places of disposal. Detailed study is necessary to address this problem and the associated financial implications.

4. WATER QUALITY

As noted in Section 2, substantial work has been carried out over the past decade in assessing water quality issues in the GTA including the Toronto Area Watershed Management Strategy (TAWMS) which commenced in 1981, the current Metro Toronto Remedial Action Plan sponsored by Environment Ontario and Environment Canada, and the Royal Commission on the Future of the Toronto Waterfront. It is clear from the work to date that the improvement of water quality requires a comprehensive approach, witness the range of potential remedial actions identified in the Metro RAP.

This section of the background report discusses the three urban structure concepts and potential improvement of water quality; however, it is not possible to identify the cost differences among the concepts with respect to water quality given the large extent to which existing water quality problems stem from existing urban and rural land uses.

4.1 METRO TORONTO REMEDIAL ACTION PLAN

The draft Discussion Paper on Remedial Options was released in April 1990 by the Metro RAP team. The discussion is structured on the basis of the seven remedial intents used in the draft Discussion Paper.

4.1.1 Remedial Intent #1: Implement Specific Plans to Correct Localized Use Impairments

The first set of potential remedial actions presented in the Discussion Paper focuses on short term "stop-gap" type solutions including remediation measures for the eastern and western Toronto beaches.

4.1.2 Remedial Intent # 2: Reduce the Impacts of Treated and Untreated Sanitary Sewage

The RAP identifies two types of action for Remedial Intent #2 as follows:

- Expand and Improve Sewage Treatment Plants;
- Reduce Sanitary Discharges from Storm Sewer Outfalls and Overflow Points (CSO).

The cost estimates for the potential improvements in these categories overlap with the sanitary sewerage cost estimates presented in Background Report No. 4 - Water, Sewer and Solid Waste Disposal Systems e.g. costs at the Main, Humber and Highland Creek sewage treatment plants in Metro Toronto. The introduction of tertiary treatment at these plants which would involve an investment in the order of $600 million.

4.1.3 Remedial Intent #3: Reduce the Impacts of Dry Weather Sources

The remedial actions under this heading focus on reducing the loads from industrial, residential and agricultural sources:

These actions do not involve major capital investments but do involve programs with annual costs in the order of $1-2 million per year.

4.1.4 Remedial Intent #4: Reduce the Impacts of Stormwater

A range of actions are identified under this heading including major capital investments and management measures, such as elimination of leaded fuel, and pet control bylaw enforcement. The major capital programs include the river basin improvements and the control of urban drainage practices.

Don River Water Quality Management Plan

As reported in the Metro Toronto RAP, the Don River Water Quality Improvement Strategy released in September 1989, shows five alternative levels of improvement for consideration by all parties. The RAP notes that Level 1, which seeks only to maintain the status quo, is not a ..."do nothing alternative and requires a large increase in resources". The following table summarizes the cost estimates for different levels of protection.

Level of Protection	Proposed Programs Annual Cost ($ million/year)	Proposed Programs 1989 $'s Total Cost (10-20 years) ($'s millions)
1 No further degradation	4-5	65-80
2 Limited aesthetic water quality and fishery improvements	12-15	200-250
3 Substantial water quality and aesthetic improvement	17-27	300-400
4 Body contact recreation most times throughout rivers; and other improvements	28-36	450-600
5 Meet provincial water quality objectives and guidelines	45-56	750-900

Following the current public review, options for the Don River will be selected as part of the overall RAP option selection process.

Some related developments are taking place in parallel with the RAP process including the following:

- the Environmental Assessment and Predesign Study through the Metropolitan Toronto Works Department for additional sewers to provide relief to the existing Don sewer system and expansion of the Main Treatment Plant;

- the Sewer System Master Plan being undertaken by the City of Toronto Department of Public Works.

Rouge and Humber Rivers

The Metro Toronto RAP notes that water quality in the Rouge River is relatively good at present. The watershed management strategy contains immediate, medium and long term actions for the improvement and protection of water resources in valley land and identifies the lead agencies responsible for implementation.

The RAP Discussion Paper includes provisions for the Humber River Basin.

Urban Drainage Practices

The need for developing a long term policy and approach for the control of urban drainage practices to achieve improved water quality is stated in the discussion paper as follows:

> "Currently most urban drainage systems are designed for quantity control (i.e. flooding and basement protection). The current practices of urban drainage are inadequate for the protection of some of the basic water uses (recreation and fisheries). If these practices continue, further degradation and loss of water uses will occur in our receiving waters.
>
> "The lack of a comprehensive provincial policy and strategy on new urban drainage has led to confusion amongst the development industry, and municipalities and provincial agencies about how to best implement controls for water use protection. As a result, the implementation of water use protection controls is inadequately considered by most municipalities across Ontario. In addition, the lack of this policy produces delays in land development approvals due to the number of agencies involved in the approval process, duplication of efforts and conflicting requirements."

The discussion paper identifies the following potential program improvements:

A. Apply the interim stormwater quality control guidelines for new development (which are being prepared by MOE/MNR) to new development in the RAP area.

B. Conduct pollution control planning studies to prioritize sites for retrofit.

C. Require redevelopment to institute stormwater quality control.

D. Retrofit ponds/stormwater management controls at existing problem sites.

Items A and C would involve significant capital costs to be borne by the development industry. The discussion paper notes that these costs would be in the billions of dollars.

4.1.5 Remedial Intent No. 5: Increase Public Awareness and Public Involvement in Environmental Programs

The remedial actions aimed at increasing public awareness and public involvement involve annual expenditures ranging up to $380,000 per year.

4.1.6 Remedial Intent #6: Foster Ecosystem Thinking Both Within and Outside the Toronto RAP

The order of magnitude costs for planning coordination programs in the MTRCA jurisdiction are as follows:

Oak Ridges Moraine	$10 million per year
Watershed Management	$0.3 million per year
Waterfront	$3.1 million per year
Outdoor Recreation	$1.9 million per year

4.1.7 Remedial Intent #7: Conduct Research In Support of Short and Long Term RAP Implementation

The costs associated with the potential improvements under this heading are relatively modest with the major item being $260,000 for additional sampling for the Toxic Contaminants Study.

4.2 CONCEPT COMPARISON: WATER QUALITY

Based on the above, it appears that the major variable among the urban structure concepts in terms of capital cost is the future potential requirement for stormwater quality control. This requirement falls into two categories:

- new urban development on "greenfields";
- retrofitting of existing urban development.

Policies for stormwater quality control have been introduced and new low density subdivisions on the urban fringes are now subject to special engineering works, such as first flush detention, provision of stilling ponds and both on and off-line ponds and manipulated wetlands. The Ministry of Natural Resources, as a commenting agency in the plans approvals process, requires newly urbanized lands to retain 125 cubic metres per hectare of first flush stormwater from new subdivisions.

While this has a cost, it is a component of subdivision engineering and servicing and is passed directly along to future residents. Intensification within existing urban areas is more difficult to address with respect to stormwater quality improvements, especially where individual redevelopments are scattered within an existing urban area and may be served with existing local services. Controls such as detention tanks at lake or river outfalls are possible, such as the detention tanks being constructed under Kew Gardens in the Beaches; however, lands for such purposes are often in very limited supply and the structures themselves would be expensive to construct as well as to maintain. No policies for retrofitting of storm systems are presently in place.

The implications of new requirements for stormwater quality control in relation to each of the three urban structure concepts are discussed below:

4.2.1 Concept 1, Spread

Concept 1 will involve some 189,100 acres of new residential development by 2021 and 34,000 acres of new industrial land (refer to Background Report No. 1). In addition, it is estimated that some 2,750 acres of land would be redeveloped in connection with this concept to accommodate the increase of population and employment in existing urbanized areas, in particular, Metro Toronto.

At present, stormwater management measures are in general use in new developments to limit stormwater runoff to predevelopment flow levels. With new development, it is also possible to require measures for stormwater quality control as discussed above and to have the

costs of such improvements included as part of the land development process.

While this approach would provide water quality protection in terms of new development, it does not provide for the retrofitting of existing development. The limited amount of redevelopment in Concept 1 would not provide as much of an opportunity for retrofitting existing urban development to achieve and improve quality of stormwater drainage as the other concepts.

The reliance upon individual motor vehicles in Concept 1 also results in the addition of large volumes of road salt application, all of which finds its way into the ground water and rivers. Studies presently under way to isolate snow removals to contained areas draining to sanitary sewers, have the impact of reduced stress on the rivers, however the salt still ends up in the larger receiving body, Lake Ontario. Use of alternatives to sodium chloride is possible, and may involve higher operational costs.

4.2.2 Concept 2, Central

Concept 2 would involve the development of about 65,900 acres of new residential land and 21,400 acres of new industrial land. Some 11,000 acres of existing urbanized land would be redeveloped in this concept predominately in Metropolitan Toronto.

Given that this concept involves higher densities of urban development and features significant urban redevelopment, it should present a more manageable situation for improving the quality of stormwater drainage including the opportunity to retrofit existing areas which have been contributing to environmental degradation. At the same time it must be recognized that policies to provide for the retrofitting of redevelopment areas to meet stormwater quality requirements must be in place to take advantage of this type of opportunity.

4.2.3 Concept 3, Nodal

Concept 3 involves the development of 114,400 acres of new residential land and 32,200 acres of new industrial land. It is estimated that some 4,750 acres of urban redevelopment would be involved in this concept.

Concept 3 does not present the same opportunity to retrofit existing urban areas through the redevelopment process as Concept 2. It does, however, provide more of an opportunity than Concept 1 given the larger area of redevelopment involved.

The development of new nodes in Concept 3, as opposed to the lower density suburban development of Concept 1 should also present

a more manageable situation for achieving stormwater quality objectives in the suburban areas. The higher densities of the nodes should improve the cost effectiveness of stormwater quality improvement measures because of the smaller land areas involved and potential economies of scale.

4.2.4 Summary of Comparison

Accordingly, Concept 2 appears to present advantages over the other two concepts for achieving stormwater quality objectives. In turn, Concept 3 appears to present advantages over Concept 1. In all cases, appropriate policies and implementation procedures must be in place to realize the goal of improving the quality of stormwater drainage. Notwithstanding the above, it is entirely possible that Concept 1 may have advantages in terms of implementation because both government and industry are organized to meet the production requirements associated with the introduction of new policies such as the improvement of stormwater quality, witness the acceptance and widespread implementation of stormwater flow management practices over the past fifteen years to limit storm runoff to predevelopment levels.

4.3 FUTURE INVESTMENT LEVELS

The Metro Toronto RAP indicates the order of magnitude capital costs associated with the improvement of water quality in the Metro area. While these costs cannot be readily extrapolated to cover the entire GTA, they do indicate the future investment levels required to achieve significant improvement of water quality.

It appears that the improvement of water quality throughout the GTA could involve capital expenditures of $2 billion at least given the cost information provided in the Metro Toronto RAP Discussion Paper. It is not possible to determine the extent to which capital expenditures would vary among the three urban structure concepts.

A RAP process has also been initiated for Hamilton Harbour at the south-west edge of the GTA. The Stage I Report on Environmental Conditions and Problem Definitions was issued in March 1989. The Stage II Report is expected to be issued later in 1990.

5. AIR QUALITY AND ENERGY CONSUMPTION

It is generally recognized that road traffic is the primary source of air pollution in major metropolitan areas. As noted in a recent article by John G.U. Adams of University College, London "Cars are a far more important source of NO, hydrocarbons, and carbon monoxide than fossil fuel power stations; Transport Statistics Great Britain reports that cars contribute about the same amount of NO to the atmosphere, 44 times more hydrocarbons and 100 times more carbon monoxide. Catalytic converters can effect substantial reductions in these pollutants - but only at the cost of increasing the output of the principal greenhouse gas, carbon monoxide."

Background Report No. 3 - Transportation Systems, describes the estimates of motor vehicle emissions and energy consumption that were obtained for each of the three concepts using the EMME Model of the Data Management Group. These are carried forward to the concept comparison, under the Greening criterion in this report, Background Report No. 7 and the Summary Report.

6. OVERALL GREENING/ ENVIRONMENT COMPARISON OF CONCEPTS

This section of the Background Report applies the relevant criteria and factors presented in the Comparison Measures Table in the Summary Report and in Background Report No. 7: Comparison of Urban Structure Concepts. The relevant factors and measures are:

2.2 Impact on Agriculture -	Has low encroachment on Class 1, 2 and 3 agricultural land
2.3 Impact on Natural Resources	Has low impact on forest resources
	Has low impact on mineral resources
5.1 Greening	Has high compatibility with regional greenlands concept
	Has high available amount of passive open space
	Has high ease of disposal of contaminated soils
	Has high potential for cleanup of contaminated soils
5.2 Sustainable Development	Has high potential for improving the quality of stormwater drainage
	Reduced atmospheric quality degradation
	Has relatively low level of transportation energy consumption.

The application of these measures based on the information presented in this Background Report is described below in the following sections. A summary of the comparison is presented in Exhibit 6.

***6.1 FACTOR 2.2: IMPACT ON AGRICULTURE*, low encroachment on agricultural land**

The comparison measure for this factor is the consumption of land with agricultural capability classes 1, 2 and 3. The estimates of agricultural land consumption presented in Section 3.2 Agricultural Capability above are:

Class	Concept 1, Spread (sq. miles)	Concept 2, Central (sq. miles)	Concept 3, Nodal (sq. miles)
1	189	39	98
2	13	6	9
3	11	0	5
TOTAL	213 (545 km²)	45 (115 km²)	112 (287 km²)

Concepts 2 and 3 would consume substantially less land with agricultural capability than Concept 1. Based on the land consumption rates presented above, Concept 2 is given a **medium-high** rating, Concept 3 a **medium** rating, Concept 1 a **low** rating.

6.2 FACTOR 2.3: IMPACT ON NATURAL RESOURCES

6.2.1 Low Impact on Forest Resources

The existing forest covered areas that would be within the urban envelope by 2021 are:

Concept 1, Spread	27 sq. miles (70 km²)
Concept 2, Central	15 sq. miles (39 km²)
Concept 3, Nodal	20 sq. miles (52 km²)

On this basis, Concept 2 is given a **medium-high** rating, Concept 3 a **medium** rating, and Concept 1 a **low** rating.

6.2.2 Low Impact on Mineral Resources

The comparison of the impact on mineral resource areas is summarized below:

Concept 1, Spread	13 sq. miles (33 km²)
Concept 2, Central	3 sq. miles (8 km²)
Concept 3, Nodal	8 sq. miles (20 Km²)

On this basis Concept 2 is assigned a **medium-high** rating, Concept 3 a **medium-low** rating and Concept 1 a **low** rating.

EXHIBIT 6
SUMMARY OF GREENING/ENVIRONMENT COMPARISON OF CONCEPTS

CRITERIA & FACTORS	COMPARISON MEASURES	CONCEPT 1: SPREAD	CONCEPT 2: CENTRAL	CONCEPT 3: NODAL
2.2 Impact on Agriculture	Has low encroachment on agricultural land	**Low:** An additional 213 sq. miles of agricultural land would be consumed.	**Medium-High:** An additional 45 sq. miles of agricultural land would be consumed.	**Medium:** An additional 112 sq. miles of agricultural land would be consumed.
2.3 Impact on Natural Resources	Has low impact on forest resources	**Low:** An additional 27 sq. miles of forest covered land would be within the urban envelope	**Medium-High:** An additional 15 sq. miles of forest covered land would be within the urban envelope.	**Medium:** An additional 20 sq. miles of forest covered land would be within the urban envelope.
	Has low impact on mineral resources	**Low:** Some 13 sq. miles of mineral resource areas would be located within the urban envelope.	**Medium-High:** About 3 sq. miles of mineral resource areas would be located with the urban envelope.	**Medium-Low:** About 8 sq. miles of mineral resource areas would be within the urban envelope.

EXHIBIT 6 (CONT'D)
SUMMARY OF GREENING/ENVIRONMENT COMPARISON OF CONCEPTS

CRITERIA & FACTORS	COMPARISON MEASURES	CONCEPT 1: SPREAD	CONCEPT 2: CENTRAL	CONCEPT 3: NODAL
5.1 Greening	Has high compatibility with regional greenlands concept	**Low:** An additional 35 sq. miles of the Oak Ridges Moraine area and 10 miles of the Lake Ontario waterfront would be within the urban envelope.	**High:** An additional 10 sq. miles of the Oak Ridges Moraine area and 4 miles of the Lake Ontario waterfront would be within the urban envelope.	**Medium:** An additional 20 sq. miles of the Oak Ridges Moraine area and 6 miles of the Lake Ontario waterfront would be within the urban envelope.
	Has high available amount of passive open space within the urban envelope (eg. river valleys and conservation areas)	**High:** About 4 acres per 1,000 people would be available. To meet the current rate of 4.4 acres per 1,000 people some 2,200 acres would be required at an approximate cost of $1.1 billion.	**Low:** About 3.1 acres per 1,000 people would be available. To meet the current rate of 4.4 acres per 1,000 people some 8,000 acres would be required at an approximate cost of $6 billion or residents would travel farther to open space if spend $1.1 billion for 2,200 acres as in Concept 1.	**Medium-Low:** About 3.2 acres per 1,000 people would be available. To meet the current rate of 4.4 acres per 1,000 people some 7,500 acres would be required at an approx. cost of $4.7 billion or residents would travel farther to open space if spend $1.1 billion for 2,200 acres as in Concept 1.
	Has high ease of disposal of contaminated soils	**Medium-High:** About 2,750 acres of urban redevelopment is involved which should result in lower quantities of contaminated soil.	**Low:** About 11,000 acres of urban redevelopment is involved and the quantities of contaminated soils would be higher than in the other concepts.	**Medium:** About 4,750 acres of urban redevelopment is involved. More contaminated soil than Concept 1 is likely, but less than Concept 2.
	Has high potential for cleanup of contaminated soils	**Medium-Low:** The lower densities of development present less economic potential for cleaning up contaminated soils in existing urban areas.	**Medium-High:** The higher densities of development may make the clean-up of contaminated soils more economically viable.	**Medium:** Clean-up of contaminated soils may be more economically viable than in Concept 1, but would not be as viable as in Concept 2.
5.2 Sustainable development	Has high potential for improving quality of stormwater drainage	**Medium-Low:** This concept presents less potential for retrofitting the existing urban area, to improve stormwater drainage quality.	**Medium-High:** This concept presents the highest potential for retrofitting the existing urbanized area.	**Medium:** This concept presents less potential for retrofitting the existing urbanized area than Concept 2, but has more potential than Concept 1.
	Reduced atmospheric quality degradation (eg. transportation emissions in the a.m. peak 3 hours)	**Low:** Greatest emission level: 5,245,000 kg	**High:** Lowest emission level: 2,602,000 kg	**Medium:** Intermediate emission level: 2,958,000 kg
	Low level of transportation energy consumption (eg. transportation energy consumed in the a.m. peak 3 hours)	**Low:** Greatest energy consumption: 46,683,000 MJ	**High:** Lowest energy consumption: 37,239,000 MJ	**Medium:** Intermediate energy consumption: 42,074,000 MJ

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6.3 FACTOR 5.1 GREENING

6.3.1 High Compatibility With Regional Greenlands Concept

The comparison measure for this criterion is compatibility with the regional greenlands concept shown in Exhibit 5. As reported in 3.1 above, the extent to which the urban envelope would encroach on the Oak Ridges Moraine area and the Lake Ontario Waterfront is as follows:

	Oak Ridges Moraine Area (sq. miles)	Lake Ontario Waterfront (miles)
Concept 1, Spread	35 (90 km²)	10 (16 km)
Concept 2, Central	10 (26 km²)	4 (6 km)
Concept 3, Nodal	20 (52 km²)	6 (10 km)

Accordingly, Concept 2 is given a **high** rating, Concept 3 a **medium** rating and Concept 1 a **low** rating for these measures.

6.3.2 High Available Amount of Passive Open Space

There are about 4.4 acres of passive open space per 1000 people in the existing GTA urban envelope. To maintain this ratio, additional passive open space would be required in each concept as indicated below.

Concept 1: Spread	-	2,200 acres
Concept 2: Central	-	8,000 acres
Concept 3: Nodal	-	7,500 acres

As discussed in Section 3.6, it would probably be feasible to obtain the additional space for Concept 1 through land acquisition at an estimated cost of $1.1 billion. Some of the land may be obtained through dedications from developers which would reduce the cost of acquisition. It would not be feasible to obtain the indicated amounts of passive open space shown for Concepts 2 and 3. If the indicated amounts of land were purchased on the open market, the cost in Concept 2 would be in the order of $6 billion. The cost in Concept 3 would be in the order of $4.7 billion. There would be more of an opportunity in Concept 3 to increase the supply of passive open space as compared to Concept 2.

Under an alternative comparison approach the assumption is made that 2,200 acres of new passive open space would be acquired under each of the concepts, within the Concept 1 urbanized area, for an

estimated capital cost of $1.1 billion under each Concept. If this more practical approach was taken the residents of Concept 2 (and, to a lesser extent, Concept 3) would have to travel further, on average than those in Concept 1 to reach the new open space, most of which would likely be in suburban areas. The same relative ratings would apply regardless of which comparison is taken. Accordingly, Concept 1 is assigned a **high** rating in relation to these measures, Concept 2 a **low** rating and Concept 3 a **medium-low** rating.

6.3.3 Contaminated Soil

As discussed in section 3.6 above, Concept 2 presents a larger problem from the standpoint of contaminated soils disposal than the two other concepts. At the same time, urban redevelopment and the associated soils cleanup of older industrial areas may be more viable economically in Concept 2 than the other concepts because of the higher densities involved.

Accordingly, two measures for contaminated soil cleanup are included as follows:

- High Ease of Disposal of Contaminated Soils;
- High Potential for Cleanup of Contaminated Soils.

High Ease of Disposal of Contaminated Soils

Concept 1 received a **medium-high** rating in relation to this factor. Concept 3 is given a **medium** rating and Concept 2 a **low** rating.

High Potential for Cleanup of Contaminated Soils

Concept 2 is given a **medium-high** rating for this factor. Concept 3 is given a **medium** rating and Concept 1 a **medium-low** rating.

6.4 FACTOR 5.2 SUSTAINABLE DEVELOPMENT

The comparison measures for this factor include the following:

- high potential for improving the quality of stormwater drainage (refer to Section 4.2 above);
- reduced degradation of atmospheric quality (refer to Background Report No. 3 for estimates of transportation emissions);
- low level of transportation automotive energy consumption (refer to Background Report No. 3 for derivation of the energy estimates).

6.4.1 High Relative Potential for Improving Quality of Stormwater Drainage

As discussed in Section 4.2, Concept 2 provides more of an opportunity to retrofit existing urban land to achieve water quality objectives as compared to Concepts 1 and 3. Also, because less land area is urbanized in Concept 2, potentially this concept would present a more manageable situation for the management of stormwater runoff and achievement of water quality objectives.
Concept 3 would also provide some opportunity to retrofit existing urbanized areas through redevelopment but not to the same extent as Concept 2. The nodalized development in Concept 3 also should present advantages over Concept 1 in terms of the potential cost effectiveness of stormwater quality management because of the potential economies of scale.

Accordingly, Concept 2 is given a **medium-high** rating on this comparison measure, Concept 3 a **medium** rating and Concept 1 a **medium-low** rating.

6.4.2 Reduced Atmospheric Quality Degradation (e.g. low transportation emissions)

Transportation can have a major impact on some of the environmental factors. One measure defined in Background Report 7 is the potential impact of transportation on air pollution. Exhibit 33 in that report shows the estimated air pollution impacts of each of the three scenarios as well as the 1986 base. These estimated emissions are based on empirical relationships between fuel consumption, emissions and average speed based on a methodology adapted from "Procedure for Estimating Highway User Costs and Fuel Consumption and Air Pollution," United States Federal Highway Administration, 1980. It does not assume any technological improvement to vehicles between 1986 and 2021. It therefore may over-estimate the potential emissions but the relative ranking between the three concepts should be indicative. Annual emissions can be estimated by multiplying the amounts in Exhibit 33 by a factor estimated to be 3,250. It can be seen that Concept 2 has significantly lower emissions compared with Concept 1. Concept 3 is intermediate. Accordingly, Concept 2 is given a **high** rating, Concept 3 a **medium** rating and Concept 1 a **low** rating.

6.4.3 Low Level of Transportation Energy Consumptions

Another measure defined for comparison of the concepts is transportation energy consumption. Differences similar to those estimated for vehicle emissions can be noted on Exhibit 33 in Background Report No. 7. Accordingly, Concept 2 is given a **high** rating, Concept 3 a **medium** rating and Concept 1 a **low** rating.